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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|--|-------------|----------------------|---------------------|------------------|
| 10/765,435 | 01/27/2004 | Subhendu Guha | USS-18302/16 | 1518 |
| 25006 | 7590 | 12/14/2005 | EXAMINER | |
| GIFFORD, KRASS, GROH, SPRINKLE & CITKOWSKI, P.C. PO BOX 7021 TROY, MI 48007-7021 | | | TRAN, THANH Y | |
| | | | ART UNIT | PAPER NUMBER |
| | | | 2822 | |

DATE MAILED: 12/14/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

| | | | |
|------------------------------|------------------------|---------------------|--|
| Office Action Summary | Application No. | Applicant(s) | |
| | 10/765,435 | GUHA ET AL. | |
| | Examiner | Art Unit | |
| | Thanh Y. Tran | 2822 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on 23 September 2005.
- 2a) This action is FINAL. 2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) 1-14 is/are pending in the application.
- 4a) Of the above claim(s) 15-21 is/are withdrawn from consideration.
- 5) Claim(s) _____ is/are allowed.
- 6) Claim(s) 1-14 is/are rejected.
- 7) Claim(s) _____ is/are objected to.
- 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on _____ is/are: a) accepted or b) objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) All b) Some * c) None of:
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

| | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ . |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date <u>5/4/04</u> . | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| | 6) <input type="checkbox"/> Other: _____ . |

DETAILED ACTION

Applicant's election without traverse of Species I (claims 1-14) in the reply filed on 9/23/05 is acknowledged.

Claim Objections

1. Claims 6-7, and 13-14 are objected to because of the following informalities:

As to claim 6: claim 6 recites "*the process gas comprises a member selected from the group consisting of: SiH₄, Si₂H₆, GeH₄, SiF₄, GeF₄ and combinations thereof*" (emphasis added). However, it is confusing because a member can not be selected with all materials. For purposes of examining this claim, the examiner will assume the above quoted limitation to mean: "*the process gas comprises a member selected from the group consisting of: SiH₄, Si₂H₆, GeH₄, SiF₄, GeF₄ or combinations thereof*" (i.e. "and" has been changed to: --or --).

As to claim 7: claim 7 recites "*the diluent is selected from the group consisting of hydrogen, deuterium, a halogen and combinations thereof*" (emphasis added). However, it is confusing because a diluent can not be selected with all materials. For purposes of examining this claim, the examiner will assume the above quoted limitation to mean: "*the diluent is selected from the group consisting of hydrogen, deuterium, a halogen or combinations thereof*" (i.e. "and" has been changed to: --or --).

As to claim 13: claim 13 recites "*the other deposition parameter being selected from the group consisting of: process gas pressure, power density of the electromagnetic energy, frequency of the electromagnetic energy, and substrate temperature*" (emphasis added). However, it is confusing because the other deposition parameter can not be selected with all materials. For purposes of examining this claim, the examiner will assume the above quoted

limitation to mean: “*the other deposition parameter being selected from the group consisting of: process gas pressure, power density of the electromagnetic energy, frequency of the electromagnetic energy, or substrate temperature*” (i.e. “and” has been changed to: --or --).

As to claim 14: claim 14 recites “*a diluent selected from the group consisting of hydrogen, deuterium, and combinations thereof*” (emphasis added). However, it is confusing because a diluent can not be selected with all materials. For purposes of examining this claim, the examiner will assume the above quoted limitation to mean: “*a diluent selected from the group consisting of hydrogen, deuterium, or combinations thereof*” (i.e. “and” has been changed to: --or --).

Appropriate correction is required.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-8, 11, and 13-14 are rejected under 35 U.S.C. 102(b) as being anticipated by Guha et al (U.S. 6,274,461).

As to claim 1, Guha et al teaches in figures 1-2 a process for the plasma deposition of layer of microcrystalline semiconductor material, wherein a process gas which includes a precursor of the semiconductor material and a diluent is energized with electromagnetic energy so as to create a plasma therefrom, which plasma deposits a layer of the microcrystalline

semiconductor material onto a substrate (see col. 2, lines 43-61), wherein the improvement comprises: varying the concentration of the diluent in the process gas as a function of the thickness of the layer of microcrystalline semiconductor material which has been deposited (see col. 6, lines 20-53).

As to claim 2, Guha et al teaches in figures 1-2 a process, wherein the concentration of the diluent is decreased as the thickness of the layer increases (see col. 6, lines 48-53 and 62-67).

As to claim 3, Guha et al teaches in figures 1-2 a process, wherein the concentration of the diluent is varied in a stepwise manner as the thickness of said layer increases (see col. 6, lines 48-53).

As to claim 4, Guha et al teaches in figures 1-2 a process, wherein the concentration of the diluent is varied as a continuous function of the thickness of the layer (see col. 2, line 62 – col. 3, line 12).

As to claim 5, Guha et al teaches in figures 1-2 a process, wherein the microcrystalline semiconductor material includes a group IV element (see col. 5, lines 36-40).

As to claim 6, Guha et al teaches in figures 1-2 a process, wherein the process gas comprises a member selected from the group consisting of: SiH₄, Si₂H₆, GeH₄, SiF₄, GeF₄ or combinations thereof (see col. 8, lines 52-54).

As to claim 7, Guha et al teaches in figures 1-2 a process, wherein the diluent is selected from the group consisting of hydrogen, deuterium, a halogen or combinations thereof (see col. 8, lines 55-57).

As to claim 8, Guha et al teaches in figures 1-2 a process, wherein the diluent comprises hydrogen (see col. 8, lines 65-67).

As to claim 11, Guha et al teaches in figures 1-2 a process, wherein the step of varying the concentration of the diluent in the process gas comprises changing the amount of the diluent in the process gas (see col. 8, lines 61-64).

As to claim 13, Guha et al teaches in figures 1-2 a process including the further step of varying at least one other deposition parameter as a function of the thickness of the layer of microcrystalline semiconductor material which has been deposited, the other deposition parameter being selected from the group consisting of: process gas pressure, power density of the electromagnetic energy, frequency of the electromagnetic energy, or substrate temperature (see col. 2, lines 43-61).

As to claim 14, Guha et al teaches in figures 1-2 a process, wherein the semiconductor material includes silicon and germanium therein and wherein the process gas includes a silicon-containing compound (“silicon to germanium”), a germanium-containing compound (see col. 2, line 62 – col. 3, line 7), and a diluent selected from the group consisting of hydrogen, deuterium or combinations thereof, and wherein the ratio of the silicon-containing compound to the germanium-containing compound is varied while the semiconductor material is being deposited so that the silicon/germanium ratio of the layer of semiconductor material varies as a function of layer thickness (see col. 3, lines 7-12; and col. 9, line 4 – col. 10, line 10), and wherein the concentration of the diluent gas in the process gas is increased as the ratio of the germanium-containing compound to the silicon-containing compound therein increases (col. 2, line 62 – col. 3, line 12).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Guha et al (U.S. 6,274,461) in view of Patil et al (U.S. 2003/0036090).

As to claims 9 and 10, Guha does not disclose the electromagnetic energy is microwave energy or radiofrequency energy.

Patil teaches the electromagnetic energy is microwave energy or radiofrequency energy (see paragraphs [0027] & [0028]). Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify the process of Guha by using the electromagnetic energy which is microwave energy or radiofrequency energy for providing a specific range of frequency (see paragraphs [0027] & [0028] in Patil).

6. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Guha et al (U.S. 6,274,461) in view of Maxwell et al (U.S. 5,786,023).

Guha does not disclose the step of varying the concentration of the diluent in the process gas comprises changing the amount of the semiconductor precursor in the process gas.

Maxwell teaches in col. 13, lines 63-67 a step of varying the concentration of the diluent in the process gas comprises changing the amount of the semiconductor precursor in the process gas. Therefore, it would have been obvious to a person having ordinary skill in the art at the

time the invention was made to modify the process of Guha by having the step of varying the concentration of the diluent in the process gas comprises changing the amount of the semiconductor precursor in the process gas as taught by Maxwell for providing a growth of the layer (thin film) or increasing layer thickness.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanh Y. Tran whose telephone number is (571) 272-2110. The examiner can normally be reached on M-F (9-6:30pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Zandra Smith, can be reached on 571-272-2429. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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